



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2015-0426; Special Conditions No. 25-576-SC]

Special Conditions: Bombardier Aerospace Incorporated, Models BD-500-1A10 and BD-500-1A11 Series Airplanes; Electronic Flight-Control System (EFCS): Pitch- and Roll-Limiting Functions

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Bombardier Aerospace Model BD-500-1A10 and BD-500-1A11 series airplanes. These airplanes will have a novel or unusual design feature associated with a fly-by-wire EFCS that limits pitch- and roll-limiting functions to prevent the airplane from attaining certain pitch attitudes and roll angles. This system generates the actual surface commands that provide for stability augmentation and flight control for all three airplane axes (longitudinal, lateral, and directional). The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: Effective [Insert date 30 days after date of publication in the Federal Register].

FOR FURTHER INFORMATION CONTACT: Joe Jacobsen, FAA, Standardization Branch, ANM-111 Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone 425-227-2011; facsimile 425-227-1149.

SUPPLEMENTARY INFORMATION:

Background

On December 10, 2009, Bombardier Aerospace applied for a type certificate for their new Model BD-500-1A10 and BD-500-1A11 series airplanes (hereafter collectively referred to as “CSeries”). Bombardier later applied for, and was granted, an extension of time for the type certificate, which changed the effective application date to December 31, 2011. The CSeries airplanes are swept-wing monoplanes with an aluminum alloy fuselage, sized for 5-abreast seating. Passenger capacity is 110 for the Model BD-500-1A10 and 125 for the Model BD-500-1A11. The airplanes are powered by two underwing Pratt and Whitney PW1524G ultra-high bypass, geared, turbofan engines. Maximum takeoff weight is 131,000 pounds for the Model BD-500-1A10 and 144,000 pounds for the Model BD-500-1A11. The CSeries airplanes will have a fly-by-wire EFCS.

Type Certification Basis

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.17, Bombardier Aerospace must show that the CSeries airplane meets the applicable provisions of part 25, as amended by Amendments 25-1 through 25-129.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Bombardier CSeries airplanes because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same or similar novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Bombardier CSeries airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36. The FAA must issue a finding of regulatory adequacy under § 611 of Public Law 92-574, the “Noise Control Act of 1972.”

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type-certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The Bombardier CSeries airplane will incorporate the following novel or unusual design feature: Fly-by-wire EFCS that will limit pitch and roll functions to prevent the airplane from attaining certain pitch attitudes and roll angles greater than plus or minus 65 degrees, and positive spiral stability introduced for roll angles greater than 30 degrees at speeds below V_{MO}/M_{MO} . This system generates the actual surface commands that provide for stability augmentation and flight control for all three airplane axes (longitudinal, lateral, and directional).

Discussion

Part 25 does not specifically relate to flight characteristics associated with fixed attitude limits. Bombardier proposes to implement on the CSeries airplanes pitch and roll attitude-limiting functions via the EFCS normal mode. This will prevent the airplane from attaining certain pitch attitudes and roll angles greater than plus or minus 65 degrees. In addition, positive spiral stability, introduced for roll angles greater than 30 degrees at speeds below V_{MO}/M_{MO} , and

spiral stability characteristics, must not require excessive pilot strength to achieve bank angles up to the bank-angle limit.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Discussion of Comments

Notice of proposed special conditions no. 25-15-02-SC for the Bombardier Model BD-500-1A10 and BD-500-1A11 series airplanes was published in the *Federal Register* on February 27, 2015 (80 FR 10632). No substantive comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Bombardier CSeries airplane. Should Bombardier Aerospace apply later for a change to the type certificate to include another model incorporating the same or similar novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on Bombardier CSeries airplanes. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type-certification basis for the Bombardier CSeries airplanes.

In addition to § 25.143, the following requirements apply to the EFCS pitch- and roll-limiting functions:

1. The pitch-limiting function must not impede normal maneuvering for pitch angles up to the maximum required for normal maneuvering, including a normal, all-engines-operating takeoff, plus a suitable margin to allow for satisfactory speed control.
2. The pitch- and roll-limiting functions must not restrict or prevent attaining pitch attitudes necessary for emergency maneuvering, or roll angles up to 65 degrees. Spiral stability, which is introduced above 30 degrees roll angle, must not require excessive pilot strength to achieve these roll angles. Other protections, which further limit the roll capability under certain extreme angle-of-attack, attitude, or high-speed conditions, are acceptable, as long as they allow at least 45 degrees of roll capability.
3. A lower limit of roll is acceptable beyond the overspeed warning if it is possible to recover the airplane to the normal flight envelope without undue difficulty or delay.

Issued in Renton, Washington, on June 17, 2015.

Jeffrey E. Duven
Manager, Transport Airplane Directorate
Aircraft Certification Service
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